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EGG PARASITOIDS OF THE CORN LEAFHOPPER, *DALBULUS MAIDIS* (DELONG AND WOLCOTT) (HOMOPTERA: CICADELLIDAE) IN NICARAGUAN MAIZE

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Abstract.—Two species of parasitoids were reared from eggs of the corn leafhopper, *Dalbulus maidis* (DeLong and Wolcott), collected in experimental maize plots in the Department of Managua, Nicaragua. *Anagrus* sp. (Hymenoptera: Mymaridae) and *Paracentrobia* sp. (Hymenoptera: Trichogrammatidae) were identified from individually reared eggs in approximately equal numbers. Peak emergence of *Anagrus* sp. occurred seven days after peak emergence of *Paracentrobia* sp. The combined rate of parasitism was 77% when host egg density reached its maximum at 22 days after plant emergence (DAE) and 93% by 36 DAE when egg densities had declined.

Key Words: Egg parasitoids, corn leafhopper, *Dalbulus maidus*, Cicadellidae, *Anagrus*, *Paracentrobia*, Trichogrammatidae

As a plant pathogen vector, *Dalbulus maidis* (DeLong and Wolcott) (Homoptera: Cicadellidae) causes severe yield losses in maize (*Zea mays* L.) grown in some ecological zones of Central America, México and the Caribbean. Populations of *D. maidis* can reach densities of up to 30 individuals per maize plant in the latter part of the rainy season between September and November (personal observation).

Because maize is grown chiefly by resource-poor farmers, research efforts on the management of *D. maidis* and the pathogens it vectors have focused on inexpensive methods such as resistant maize varieties (Urbina 1982), cultural methods including varietal mixtures (Power 1987) and planting densities and weed management (Power 1989, Sediles 1989), microbial control (Quiroz 1991), rationalization of insecticide use (Gomez 1989) and parasitoids and predators (Perfecto 1989, Vega and Barbosa 1990, Vega et al. 1991, Quezada 1979). The natural enemies known to affect adults and nymphs of *D. maidis* as reviewed by Vega and Barbosa (1990) include predators such as spiders, coccinellids and ants, two species of entomopathogenic fungi and two species of parasitoids. To date, the mortality factors of the egg stage of this important pest have not been studied.

A search for egg parasitoids of *D. maidis* was conducted in the Centro Nacional de Investigación de Granos Basicos "Humberto Tapia Barquero," Department of Managua, Nicaragua in maize grown in the rainy season of 1989. The study site is at 60 meters above sea level, a seasonal deciduous forest zone now converted to the production of basic grains and cattle ranching. The area has a five to six month dry season and an average of 1200 mm of rainfall from May through November.

MATERIALS AND METHODS

We examined eggs collected from four experimental plots of each of three maize varieties (NB-6, NB-12, and H-5). A total of

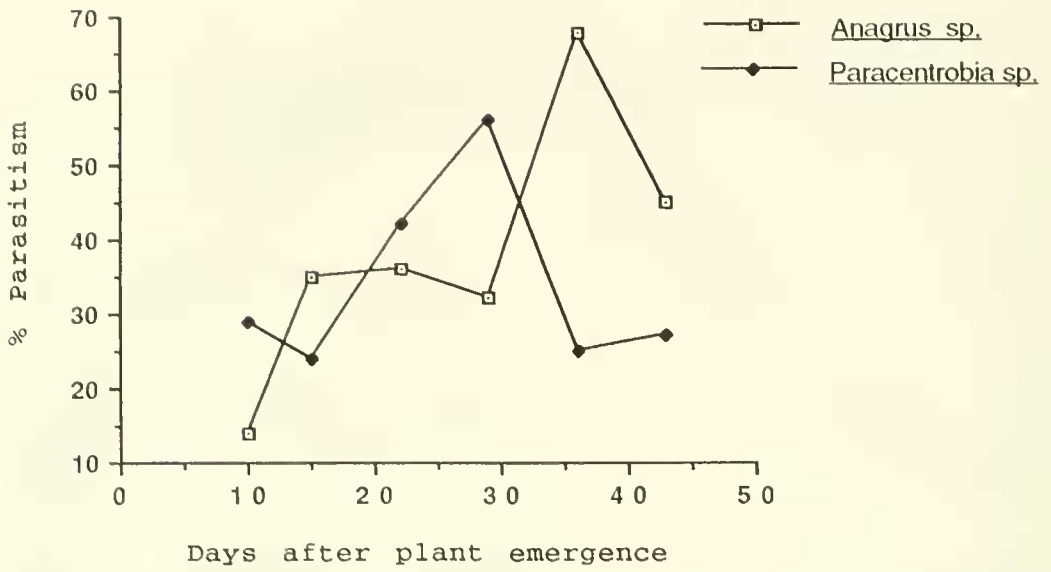

Fig. 1. Emergence of *Anagrus* sp. and *Paracentrobia* sp. from *Dalbulus maidis* eggs collected in maize, Department of Managua, Nicaragua, 1989.

690 eggs were collected in weekly samples for six weeks in August and September of 1989. Collections were made from 10 seedlings in each of the 12 plots at 10 and 15 days after plant emergence (DAE). At 22, 29, 36 and 43 DAE collections were made from the third unfurled leaf below the whorl on 10 plants in each of the 12 plots. The density of *D. maidis* eggs per m^2 of leaf was calculated using a leaf area meter.

On examination with a microscope, microfilaments were seen on many of the eggs which later yielded parasitoids. All species of *Dalbulus* have microfilaments extending from the egg (Heady and Nault 1984) but no other species in this genus have been recorded from Nicaragua (Power 1987). Other leafhopper genera also produce microfilaments (Heady and Nault 1984) but an extensive study of leafhoppers in Nicaraguan maize (Saenz 1971) showed that 100% were *D. maidis*. Given these studies and the fact that only Cicadellid nymphs emerged from the unparasitized eggs, we conclude that the eggs studied were *D. maidis*.

Eggs were located with a light box, excised from the leaf with a sharp pin, sterilized with 3% sodium hypochlorite for two minutes, rinsed with sterile water and placed individually in small glass vials. The vials were capped with rubber stoppers or corks and a small filter pack wick under the stopper was used to introduce sterile water to the vial to prevent the egg from desiccating. The eggs were maintained in an air-conditioned laboratory at approximately 24–25 C. with natural day-length. Slightly more than 50% of the eggs reared in this manner eclosed or produced parasitoids. Mortality of the rest was caused principally by fungal contamination or by desiccation, both considered to be a function of the rearing conditions.

Samples of the parasitoids were identified at the Systematic Entomology Laboratory, Plant Sciences Institute, USDA, U.S.A. and at the Bee Research Laboratory, Plant Sciences Institute, USDA, U.S.A. Representative specimens were deposited in the United States National Collection and voucher specimens were placed in the Co-

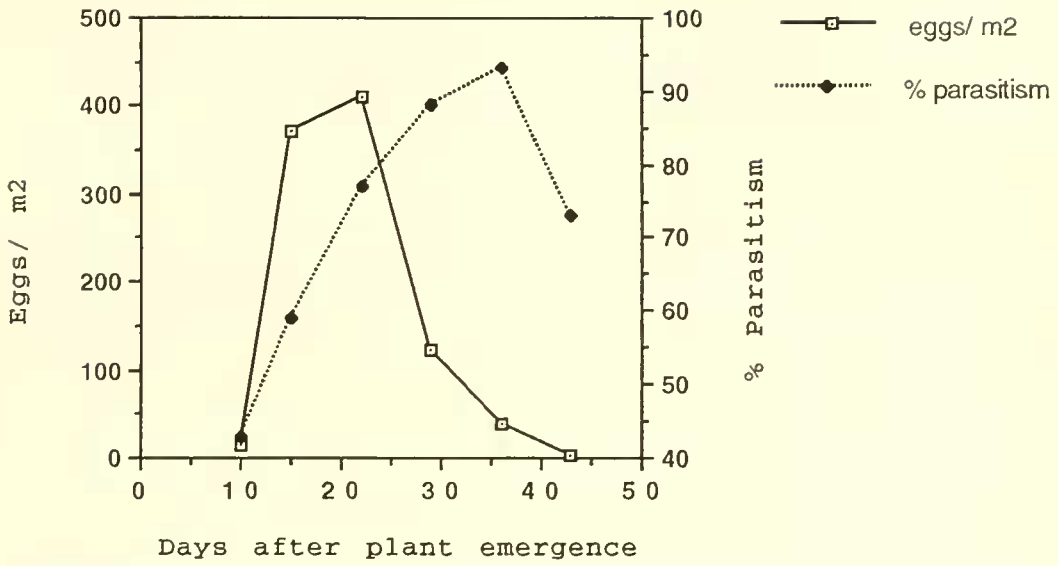

Fig. 2. Phenology of combined parasitism rate and host egg density for *Dalbulus maidis* and the egg parasitoids *Anagrus* sp. and *Paracentrobia* sp. in maize, Department of Managua, Nicaragua, 1989. Closed diamonds represent % parasitism and open squares represent egg density.

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Results and Discussion

Two species of parasitoids, *Anagrus* sp. (Hymenoptera: Mymaridae) and *Paracentrobia* sp. (Hymenoptera: Trichogrammatidae), were reared from *D. maidis* eggs in approximately equal numbers (Fig. 1). Both species emerged from eggs collected early in the maize cycle (10 DAE) and continued to emerge from eggs collected on the last date (43 DAE). *Paracentrobia* sp. parasitism was greatest in eggs collected at 29 DAE, seven days earlier than the maximum recorded for *Anagrus* sp. (Fig. 1).

This study provides some evidence refuting an hypothesis expressed by Heady and Nault (1984) that the microfilaments of leafhopper eggs may function to prevent parasitism. Some parasitized eggs produced microfilaments after they were collected from the field. Microfilaments form 48–72 hours after oviposition (Heady and Nault 1984) and this window is sufficient for the female parasite to locate and oviposit in the egg. The presence of microfilaments did not appear to interfere with the parasite development.

The combined rate of parasitism was 77% when host egg density reached its maximum at 22 DAE and 93% by 36 DAE when egg densities had declined (Fig. 2). We found the high rate and rapid increase of parasitism early in the maize cycle to be encouraging even though it was observed at densities of *D. maidis* that were well above the currently used economic injury levels of 1–2 insects per plant. Studies of parasitism in sparse populations of *D. maidis* would help determine the potential impact that conserving the parasitoids would have on the control of this pest.

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